Net generation or Digital Natives: Is there a distinct new generation entering university?

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Abstract

This article reports key findings from the first phase of a research project investigating Net generation age students as they encounter e-learning at five universities in England. We take a critical view of the idea of a distinct generation which has been described using various terms including Net generation and Digital Natives and explore age related differences amongst first year university students. The article draws on evidence from a survey of first year undergraduates studying a range of pure and applied subjects. Overall we found a complex picture amongst first year students with the sample population appearing to be a collection of minorities. These included a small minority that made little use of some technologies and larger minorities that made extensive use of new technologies. Often the use of new technology was in ways that did not fully correspond with the expectations that arise from the Net generation and Digital Natives theses. The article concludes that whilst there are strong age related variations amongst the sample it is far too simplistic to describe young first year students born after 1983 as a single generation. The authors find that the generation is not homogenous in its use and appreciation of new technologies and that there are significant variations amongst students that lie within the Net generation age band.

Keywords: computer-mediated communication; cooperative/collaborative learning; distributed learning environments; pedagogical issues; post-secondary education

1. Introduction

We are told that there is a new population emerging from young people born after the time when digital technologies began to be embedded in social life sometime in the 1980s (Palfrey & Gasser 2008, Tapscott 2008). These young people having grown up with computers and the Internet are said to have a natural aptitude and high skill levels when using new technologies. Older people are characterized as being at least one step behind and unable to reach the kinds of natural fluency that comes with having grown up with new digital technologies. Furthermore we are told that this generational shift has consequences for approaches to learning because the new generation requires rapid access and quick rewards, is impatient with linear thinking and displays a novel capacity for multi-tasking. This argument is not new but it continues to have a contemporary significance despite having received a recent critical response from a variety of empirically (e.g. Kennedy, Judd, Churchward, Kay & Krause 2008) and theoretically (e.g. Bayne & Ross 2007, Bennett, Maton & Kervin 2008) based arguments. The argument persists even after some of the originators of the idea have begun to distance themselves from it (Prensky 2009). This article considers these arguments in the context

of a new generation of learners entering university in England and is based on research conducted in 5 universities.

This issue has added importance because it suggests that teachers and educational institutions have a responsibility to change in response to the assumed demands of this new generation of learners. The Vice Chancellor of the Open University (UK) had this to say to the university council:

> "Most of our students, moreover, are part of what we now describe as the Net Generation. This is a generation who think IM, text and Google are verbs not applications! "They expect to be engaged by their environment, with participatory, sensory-rich, experiential activities (either physical or virtual) and opportunities for input. They are more oriented to visual media than previous generations – and prefer to learn by doing rather than by telling or reading." They prefer to discover rather than be told. (Becta Research Report 2008, page 13) So, as John Thompson frames the question: "Is education 1.0 ready for Web 2.0 students?" (Brenda Gourley VC Open University (UK), Council and Staff Address 26th September 2008)

What is striking about this source is that the Open University (UK) has a largely mature intake of students with only about 20% of first level students being under 25 years of age.

The importance of the comment by Brenda Gourley is that it relies on a consistent image of the Net generation and Digital Natives that has become commonplace and is regularly reproduced in keynote addresses, policy discourse and the literature relevant to practitioners (e.g. Oblinger 2006, Barnes, Marateo & Pixy Ferris 2007, Thompson 2007). For example in this keynote speech:

> "One student walks across campus listening to an iPod; another is engrossed in text messaging on her cell phone. During class, they're Googling, Instant Messaging and playing games - often at the same time. More likely to use the library as a gathering place than a resource, this is the Net Generation. (Oblinger 2006)

Bayne and Ross (2007) have argued that the persistence of this image of the Net generation or Digital Native student has a strong relationship to the logic of the market and a culture of enterprise and it is evident in advertising that these ideas are clearly reinforced by marketing aimed at the education sector. Research Machines for example has this account on its web site:

> "It's become a stereotypical statement, but children today really are digital natives. Much, much more than most of us realise. Even more so than most readers of this article, who are probably reasonably ICT literate." http://www.rm.com/Secondary/InTheNews/Article.asp?cref=MNEWS1122876

This article critically reviews the available literature and appraises the main theses that arise from this drawing on recent research conducted in English universities, aspects of which have already been partially reported in a series of conference papers (Jones and Ramanau 2009a, Jones and Ramanau 2009b and Jones and Cross 2009).

2. The Net generation and Digital Natives

There are a number of competing terms that claim to identify a generation of young people who are now entering universities across the world. Three of the most common terms in circulation are the Net generation (Tapscott 1998, 2008), Digital Natives (Prensky 2001a and b and 2009) and Millenials (Oblinger & Oblinger 2005). Each way of describing this new generation carries with it some distinct features but in general the terms are used interchangeably. One of the differences is in terms of the dates that bracket the new generation. Tapscott starts the new generation with extreme precision in January 1977 and ends it with a further generational shift into Generation Next in December 1997 (Tapscott 2008 p16). He clearly views the Net generation as part of a succession of generational types in the post-World War 2 era. Prensky is not specific about dates that define this new generation which is somewhat odd given that he suggests that there is a radical break between the generation he describes and previous generations. However other authors that make use of the idea of the Digital Native suggest that Digital Natives appear after 1980 (Palfrey & Gasser 2008 p1). Oblinger & Oblinger put a precise date on the Millenials suggesting that they were born 'in or after 1982' (Oblinger 2003 p38) and that this generation ends in 1991 (Oblinger & Oblinger 2005 2.9). They suggest that the generational boundary is sharp and that just a few years makes a significant difference in young people's attitudes. Oblinger takes her view of the Millenial student from Howe and Strauss who have a strong focus on the USA in contrast to other authors who advance a more general thesis. Howe and Strauss (2000) also extend the thesis into the years after the millennium unlike Oblinger who adds a clear end date in 1991.

Given the almost universal claim that this Net generation of Digital Natives is marked out by clear boundaries in terms of their attitudes, in the form of a 'discontinutity' or 'singularity' (Prensky 2001a), the lack of clarity in terms of the years that define the population is striking. For the purposes of our research we have designated all students born after 1983, who were 25 or younger at the time of the research, as part of the Net generation or Digital Natives.

Recently the idea of a Net generation and the term Digital native has come under some critical scrutiny. Bennett et al. (2008) have argued that there are still significant questions surrounding the main claims made about a new generation of learners and that for the most part the debate has been neither empirically nor theoretically informed. They go on to maintain that the debate can be likened to an academic form of 'moral panic' in which arguments and assertions are couched in overly dramatic language which then lead to appeals for urgent action and fundamental change. They also note that this academic moral panic is associated with polarized and determinist arguments in which descriptions rely on oppositions between digital natives and digital immigrants, a new Net generation and all previous generations and in which change is portrayed as inevitable with those who resist these characterizations being represented as simply being resistant to change, out of touch with reality and as not having legitimate concerns (Bennett et al. 2008 pp782-783). Bennett et al.'s critique of the language of moral panic is that it closes down debate and allows unsupported claims to circulate and gain credibility. Bayne and Ross (2007) are equally sceptical about the nature of the claims made about the pressures arising in education from a new generation of Digital Natives. They suggest that the arguments lead to a one way determinism forcing institutions and teachers to change. They also note a paradox lying at the centre of this debate because each person is fixed by their generational position, you either are or you are not a 'native'

but this sits alongside a requirement to change to become more like the natives, a digital immigrant at least. In turn this leads to a deficit model for professional development in which however hard older academic staff try they will never be able to bridge the gap arising from their generational position (Bayne and Ross 2007).

Empirical work that examines the nature of young university students finds that the generation entering university is more complex than the literature would lead an observer to expect. Kennedy et al. (2008) found that amongst first year Australian students use of technologies there was significant diversity when looking beyond the basic and entrenched technologies. They found that the patterns of access to, use of and preference for a range of other technologies varied considerably. They argued that their findings ran counter to many of the assumptions that underpin both the idea of the Digital Native found in Prensky (2001a) and the similar set of ideas advanced by Tapscott using the term Net generation (Tapscott 1998 and 2008). They went on to suggest that the fundamental changes that have been proposed to accommodate the claims made about the characteristics of this new generation of learners didn't not seem to be warranted by the evidence they had gathered. They also note that it would necessarily be difficult because the generational grouping showed a high degree of technological diversity. Overall they characterized first year students as possessing a core set of technology based skills whilst beyond this core there were a diverse range of skills across the student population (Kennedy et al. 2008 p117).

In the UK Margaryan and Littlejohn (2009) found that students used a limited range of established technologies for learning and another limited range for recreational and social use. They found that there were low levels of use and degrees of familiarity with some more advanced technologies and services such as virtual worlds and personal web publishing. Also their research provided no evidence to support the claims that students were adopting radically different study patterns indeed they argued that students' attitudes to learning appeared to conform to fairly traditional pedagogies, dependant on the lecturing staff even though there were some minor uses of technology and tools to deliver course content. Selwyn (2008), basing his argument on survey evidence from UK students, has suggested that the new generation of learners are no more homogenous than were previous generations. In particular Selwyn points to the existence of gender differences and he notes that the gender divide he finds in the survey data does not necessarily follow the lines of division that might be expected from earlier research.

In the USA, Kvavik (2005) found that undergraduate students had basic office computing skills, were frequent users of email and instant messaging and surfed the Internet (Kvavik 2005 7.7), but that these high levels of use and skill did not lead on either to a preference for increased use of technology in the classroom or adequate skills in using these skills for academic activities (Kvavik 2005 7.17). In a following study, Caruso and Kvavik (2005) found that students were comfortable with a core set of technologies but they were less comfortable with specialised technologies. Further ECAR studies of US students show that in terms of skills with core applications used for studying that there were few gender differences with males and females reporting similar skill levels for most applications (Salaway, Caruso & Nelson 2008 p11). Salaway et al. also found that age was a significant factor in terms of the usage of what they describe as communication and

collaboration technologies such as text, IM and social networking (ibid p 49). The 2008 survey continued to report that students were not looking for extensive use of ICT on their courses and that the use of information and communication technologies (ICT) needed to be balanced with other activities, in particular face to face activity. (Salaway et al. p 16). The 2008 survey had a particular focus on Social Networking and reported that up to 82% of US university students were registered with one or more social networking sites, with Facebook and MySpace being the most frequently cited. The survey also reported that the students spent up to five hours per week on these sites with the majority of students logging in on a daily basis (Salaway et al. 2008 pp, 81-100)

Work exploring new generation learners and their relationship to technology has also been undertaken outside of the advanced industrial countries and in South Africa it showed that ICTs formed some part of teaching and learning for a diverse group of students (Brown & Czerniewicz 2008). However whilst almost all South African students were exposed to ICTs the use of these technologies was rarely frequent and despite the hype associated with Web2.0 technologies, there was low use of these for teaching and learning. Use of digital and networked technologies for learning were not found to be entrenched in courses, nor were these technologies found to be ubiquitous in students' everyday lives. Use by South African students was found to be linked to a requirement to use technologies on the students' course and use of technology tended to focus on course content. These findings about Web 2.0 technologies and course content were noted by Brown & Czerniewicz (2008) to be similar to findings in the UK and US.

Overall there is growing theoretical and empirical evidence that casts doubt on the idea that there is a defined new generation of young people with common characteristics related to their exposure to digital technologies and networked communication throughout their lives. Despite the growth of this evidence base the arguments about a new Net generation of Digital Natives persists in a popular discourse which is replicated in policy and practitioner literatures. For these reasons we argue that further work needs to be done to examine the characteristics of students entering university in order to identify those changes that are taking place and to provide a fuller and more complex picture of the new generation of learners.

3. Research and methods

This article is based on the first phase of a two year study which took place in the spring of 2008 in five universities in England. The universities were selected to represent the main 'types' of university found in the English system and access was gained to 14 courses across a range of pure and applied subject and disciplinary areas (see Table 1 for a more detailed description of universities and courses under study). A questionnaire exploring the experiences of first year students as they encountered university e-learning provision was developed by the research team and administered in all five participating institutions. The survey instrument was developed with reference to the prior surveys conducted by Kennedy, Kraus, Judd, Churchward & Gray (2006) and the Educause ECAR studies (Salaway et al. 2008 Appendix B). The instrument collected baseline data

about key aspects of the students' use of technology in their social life and for study purposes and it consisted of four sections: demographic characteristics of the respondents, access to technology, use of technology in university study and finally course-specific uses of technology.

The access to technology section sought to collect information on levels and nature of student access to computer software, hardware, mobile devices, games consoles and networks. The use of technology section was comprised of 16 self-report questions aimed at finding out more about the importance and frequency of student access to the Internet for social life and study, locations of online access, use of Web 2.0 tools, virtual worlds and games as well their confidence levels in performing most common ICT tasks. Three of these questions were on a 5-point Likert-scale. The course-specific technology usage section was mainly concerned with exploring the frequency and nature of technology use in the context of specific courses, the usefulness of various types of online communication between the students and their institution and student attitudes to using ICT on the courses under study.

The instrument was piloted on an individual basis in electronic and paper formats with a small number of students (n=5) for timing and understanding of the individual items and the overall structure of the questionnaire. The pilot tests resulted in the rewording of several items and the removal of others, either because they were unclear to the students answering the pilot questions and an acceptable revised wording could not be found or to reduce the overall time taken answering the survey. The research team had agreed with participating course teams to place a time limit for completion of the questionnaire at 20 minutes, a duration that was at the margin of acceptability for some of the courses. A gap in piloting emerged when the survey was issued because no pilot testing had been undertaken with non-native English speaking students and the time taken by students who did not have English as their first language was significantly longer than for native English speakers. The survey was also submitted to a Student Research Project Panel which provided feedback on the questionnaire. The sample was purposive and relied for its validity and generalisability on the selection of representative university types and a broad range of subject and disciplinary types (Table 1). The survey developed in this first phase of research was intended to be a single 'snapshot' of student activity gathered towards the end of the first year of university studies. It was also used to pilot test some of the items to be used in the questionnaires for the second phase of the study.

Table 1: University types. (Jones and Ramanau 2009a)

	University A	**University B**	**University C**	**University D**	**University E**
Founded	Founded 19th Century	Founded 1970s (Polytechnic) university status in 1992	Founded 1960s	Founded 1960s	Founded 21st Century from university college
Location	Large urban	Large urban	Large scale	Mid size	Mid size

	metropolitan	metropolitan	distance	campus outside small city	with multi-site campuses in small towns
Course units	English	Sociology	Science	Modern Languages (2)	Journalism
	Bio-science	Information and Communication	Health and Social Care	Computing	Psychology
	Veterinary science		The Arts	Accounting and Finance	Social Work

Course registration at the time of the survey was a maximum of 1809 students and a total of 596 first-year students completed the survey yielding a response rate of approximately 33%. A further 62 responses were excluded because students had either failed to finish the survey form or had not signed the consent sheet. The method of delivery used for each course varied between electronic and paper format and was determined on a case by case basis. When it was possible surveys were issued either using an online link or on paper during class sessions. In all place based universities students were invited to participate during a short presentation by a member of the project team or university teaching staff and in the case of distance students an email and letter were sent in place of the introductory presentation. Following this initial contact, follow-up emails, including a link to the online survey, were sent to all students on each course. Some verbal reminders were also given by teaching staff in subsequent lectures. Three versions of the survey were produced, an online version accessible via the Internet, a paper version for distribution and collection within a teaching session and for distance learners a paper version that could be mailed to their home and returned in a prepaid envelope. Of the fifteen courses surveyed (14 subject areas with 2 language courses at university D) nine courses used only online surveys, five offered a combination of online and paper and one used paper only.

Table 2 summarizes key demographic characteristics of the respondents by university. In addition to differences in the subject areas that students studied, reported in Table 1, there were significant differences in a variety of demographic features such as gender, student age and nationality.

Table 2. Key Demographic Characteristics (% of the total) (Jones and Ramanau 2009a)

	University A	**University B**	**University C**	**University D**	**University E**	Overall
Male	22.3	27.3	36.1	43.2	16.3	27.8
Female	77.7	72.7	63.9	56.8	83.7	72.2

UK Students	96.6	95.3	93.3	80.8	98.0	93.9
International Students	3.4	4.6	6.7	19.2	2.0	6.1
18-25 years of age	96.0	89.1	12.6	95.9	84.4	75.8
Older than 25	4.0	10.9	87.4	4.1	15.6	24.2
Full-time student	99.4	96.9	5.1	100.00	99.0	80.3
Part-time student	0.6	3.1	94.9	0	1.0	19.7
Total number	176	128	119	74	99	596

To clarify the nature of age differences the data which had been collected in the form of the year of birth was firstly divided into two categories representing the Net generation students and those older (26 years of age and above and 25 years of age and under). The sample was then organised into four age bands – 20 years of age and under, 21 to 25 years of age, 26 to 35 years of age and older than 35 years of age. Further variables relevant to student experiences were examined including gender, institutional affiliation and type of university i.e. place based or distance mode.

The results of the survey should be treated with some caution because the sample was purposive rather than representative of all first year students in English universities. Also the fact that that the participants were volunteers (which led to limited response rates for both paper and online versions of the questionnaire) places further constraints on the generalisability of the study's results. Another limitation is that some of the questionnaire items relied on student self-reporting of the frequency and nature of their technology use and describing their own skill levels. Previous research has shown (e.g. Douwes, de Krakera, H. & Blattera 2007) that self-reported data on computer use is not always a reliable source of evidence.

4. Results

In terms of general characteristics just over three quarters (77.4%) of the respondents owned a laptop and over a third (38.1%) owned a desktop computer. Very few (0.4% n=2) had no access to a desktop computer with only slightly more (1.4% n=8) no access to a laptop and over half (55.4%) reporting use of a desktop computer in a public place. These findings mirror surveys conducted in the USA (Salaway et al. 2008) and Australia (Kennedy et al. 2008) in terms of the ownership and access to computers and they confirm the findings of other UK studies (Margarayan and Littlejohn 2009). Over two thirds (70.1%) of those asked, felt that their access to computers was sufficient to meet their computing needs whilst a further 26.4% said it mostly met their needs. Over half of the respondents had a broadband connection (55.6%) and 39.5% had access via a broadband wireless hub /router. We were surprised at the number of students (13.4%)

who reported that had a wireless mobile connection but this was supported by cross referencing other items and in open text answers. In a second item we had asked students where they accessed the Internet and included the option of 'anywhere, mobile Internet'. Whilst this isn't directly comparable with a question specifically identifying mobile broadband access it gives confirmation of the approximate size of the minority of students because 11.1% of respondents reported using mobile Internet and cross-tabulation reveals that 9% of students responded positively to both questions, however this would also suggest that we need to be cautious in interpreting these results.

Almost all students owned a mobile phone (97.8%) and these phones were often equipped with a camera (91.9%), music player (77.25) and Internet access (75.7%). Memory sticks were the second most commonly reported device (87.9%) but as with many other devices there was a small minority who did not own or have access to one (7.9%). An Mp3 device or other digital music player was commonly owned (82.4%) but a games console (38.4%) was less commonly owned although there was a significant amount of shared use (21.5%) and there was a large minority who reported no access at all (39.5%). When we asked which of these devices they would miss the most if they did not have access to it most chose their mobile phone (83.2%) and in open text answers it was clear that this was because the phones had *several* functions (i.e. the phone function was not the only, or indeed the primary, benefit). Fuller details of these results can be found in Jones and Cross (2009)

One of the questionnaire items asked about the importance of Internet access for a number of technology-related activities.

Table 3. The importance of Internet activities (Jones and Cross 2009)

	Important	Not very important	Unimportant
Accessing course information	93.6%	5.2%	1.2%
Accessing study material	89.9%	8.2%	1.9%
Download/stream written material	70.7%	21.2%	8.1%
Download/stream audio material	38.8%	43.6%	17.6%
Download/stream TV and video	40.1%	39.8%	20.1%
Uploading materials (audio/images/video)	44.8%	37.6%	17.6%
Keeping in touch with other students and friends	81.5%	13.0%	5.6%

Students were asked how important Internet access was for a variety of activities and the activities that they rated as the most important were accessing materials and communicating. Examining the item concerned with accessing course information and study materials there appeared to be differences between Net generation age and older students (χ^2 =36.82, d.f.=2, p < .001 and χ^2 =57.97, d.f.=2, p < .001) and between gender groups (χ^2 =20.56, d.f.=2, p < .001 and χ^2 =12.07, d.f.=2, p = .002). Younger students and men regarded the Internet as more important for these activities than older students and women. There were also differences between universities in how important Internet access was thought to be (χ^2 =59.64, d.f. = 8, p< .001) and in particular differences between university's modes, i.e. between distance and place based universities (χ^2 =56.68, d.f. = 2, p < .001). Students in place based universities saw the Internet as being more important than students in the distance university. The other differences between universities were consistent across a number of items but it was difficult to analyse or describe these differences in a meaningful way with so many potentially contributing factors. For example some universities in our sample had most students co-located on campus, whilst other university students were quite dispersed and access to the Internet was another factor that varied widely in each university setting.

Some arguments about Web 2.0 and Net generation age students suggest a greater inclination amongst younger students towards participatory digital technologies including the uploading and downloading of multi-media (Jones 2002, Clark, Logan, Lukin, Mee & Oliver 2009). The importance of activities based on accessing materials and communicating in our data might suggest that these arguments are somewhat exaggerated. However there was a minority in our sample that reported that uploading and downloading audio and video was important to them. In a similar way to items concerning access to course information there were differences for items relating to the importance of the Internet for downloading and uploading materials. In terms of age group (χ^2 =72.60, d.f. = 6, p < .001) younger students and Net generation age students (χ^2 =57.97, d.f. = 2, p < .001) were the more likely to upload and download materials than older students. There were difference between the modes of university study (χ^2 =1.19, d.f. = 2, p < .001) with students in place based universities more likely to view the Internet as important for uploading and downloading materials. Then again a more in-depth examination of age showed that even within the Net generation age students there were differences in their views regarding the importance of the Internet. For example, students aged 20 years of age and younger were more likely to regard the Web as being important for downloading or streaming TV and video (χ^2 =8.06, d.f. = 2, p = .02).

The analysis of other questionnaire items suggested a very similar tendency. For example, when asked about the frequency of performing some of the most common technology tasks the sub-set of younger Net generation students (i.e. those aged 20 years of age and younger) reported being more frequently engaged in instant messaging, sending text by a mobile phone, participating in social networks, downloading or streaming TV or video and uploading images, audio and video onto social networking sites and (see Table 4 below for descriptive statistics and ANOVA test results).

Table 4. Item Means and F values on Self-Reported Frequency of Technology Tasks among Net generation Students (5-Point Scale, d.f. = 1).

	20 and under	21-25	F
Read and send e-mail	4.33	4.34	.02
Use mobile phone messaging	4.81	4.66	4.46*
Instant messaging	3.75	3.36	6.09*
Participate in online social networks	4.32	4.06	4.36*
Read and write blogs	1.57	1.58	.01
Use Wikis	2.76	2.69	.39
Play games	2.29	2.51	2.50
Download/ stream music	2.97	2.80	1.41
Download/ stream TV/ video	2.81	2.29	13.34**
Upload audio, images or video to social networks	2.47	2.32	7.57

* $p < .05$
** $p < .001$

A more detailed analysis of one of the items where significant differences were reported suggested a much more complex picture of technology use. Students who were 20 years of age (i.e. those born in 1988) were more likely to upload audio, graphics and video than younger students and students aged 25 years of age tended to perform this task more frequently than students aged one, two or even three years younger than they were. In other words, there were differences across students by year of birth within the cohort of students aged 25 years of age and under, which questions the homogeneity of the Net generation students. In addition to that, it shows that depending on the nature and type of technology use the relationship between student age and frequency of technology use is not always one in which use declines with age.

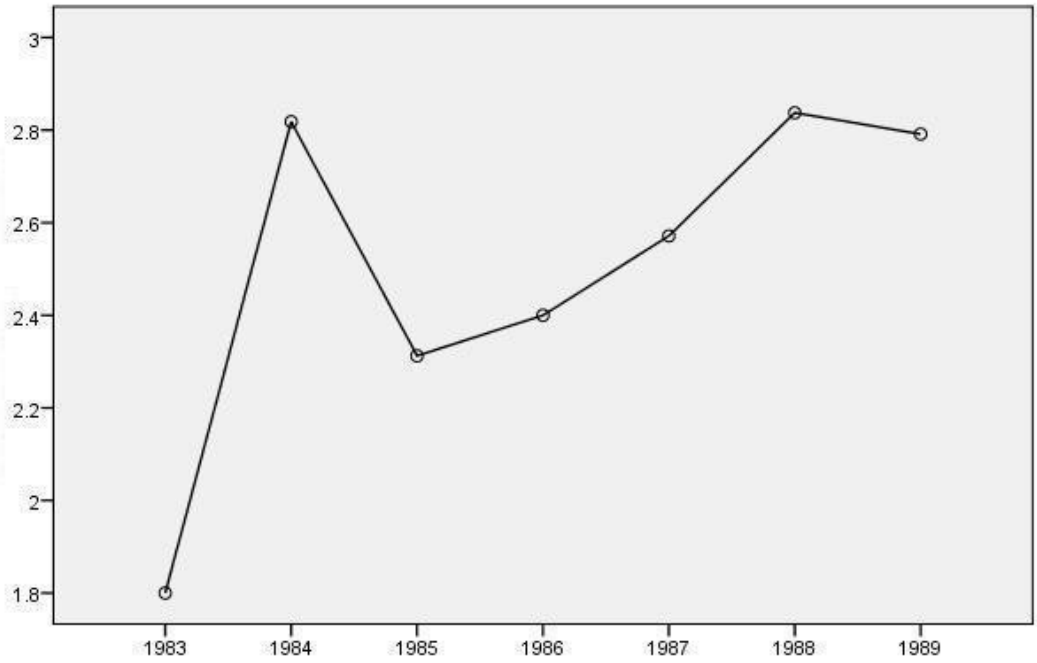

Fig. 1. Means of self-reported frequency of uploading audio, images and video on social networking sites (5-points scale) by year of birth.

4.1 Use of Web 2.0 Technologies

The Net generation arguments claim that an entire generation who have grown up with technology exhibit different preferences and report different communicative practices to older people (Palfrey & Gasser 2008, Tapscott 2008). The Net generation and Digital Natives described in this literature are not only the users of Web 2.0 but their experiences provided the core of what was to become Web 2.0 (Tapscott 2008 p18). They are described as constantly connected with plenty of friends in social networking sites (Palfrey &Gasser p5). In total, 68.3 percent of the respondents in the sample participated in online social networks (e.g. Facebook, Bebo, MySpace) at least on a daily basis or more frequently, but there was a large variation in terms of frequency of use between different types of universities ($F_{(4, 587)} = 60.20$, $p < 0.001$) and students aged 25 years of age and under and older students ($F_{(1, 587)} = 332.23$, $p < 0.001$). For example, only 25.7 percent of University C students reported a daily usage of social networks (including 26.7 percent of those age 25 years of age and younger) compared to 90.5 percent of students at University D.

Interestingly, although a majority of University C's (mainly older) students had never used a social networking site, there were also considerable minority groups of students in other universities who also reported not participating in social networking, e.g. 11.0 and 11.2 percent of students studying with universities A and B. Whilst at University A the majority of those who never used a social networking website were mature students, at University B it was students aged 25 years and younger who were less likely to have used social networking sites (8.8 percent of students in this group reportedly never used these websites). When asked whether their use of social networking sites had increased since beginning university 74.8 to 87.7 percent of the Net generation aged students in place based universities agreed with the statement compared with only 26.7 percent of students (or 18.8 percent of older students) at the distance mode University C. This low reported increase compares to more than 53.3 percent of the older students at University A who reported an increase in their use of social networking sites. The data on social networking site use suggests further work is necessary to investigate institutional contexts and modes of teaching and learning as influences that may affect student use of social networking sites.

When the differences across two rather than four age groups were explored younger respondents reported more frequent use of social networking websites ($F(3, 584) = 554.20$, $p < 0.001$), e.g. only 4.3 percent of those aged 20 and younger never used this technology compared to 78.5 percent of those aged 35 years of age and older. Amongst Net generation age students (25 and under) 81.7 percent used social networking on at least a daily basis, whilst only 5.1 percent 'never' participated in online social networks. In comparison 55.7 percent of students aged 26 years of age and older reported they had never participated in social networking sites and only 24.3 percent of them reported the frequency of usage reported by most younger students. Younger respondents tended to have more experience of using social networking sites than older students. However, the differences between place based and distance institutions also appeared to be highly significant. For example, the Net generation age students at the distance mode university tended to both use social networking sites less frequently than students in other universities and to report a lower increase in the frequency of use during their first year of study. Moreover, when looking at both the experiences of younger and more mature first-year students in place based universities different patterns of use emerge, which suggests that further investigation is required into the ways in which student technology use is mediated by institutional and possibly even individual course and departmental contexts.

Gender differences did not appear to be quite as pronounced and there were no statistically significant differences in terms of the frequency of participation in social networks ($F(1, 587) = 2.93$, $p = 0.09$). However though not statistically significant, female students tended to report using social networking sites more frequently (sample mean of 3.83 compared to 3.60 for men) and fewer women had never used a social networking website compared to men: 15.5 percent compared to 21.3 percent. There were no significant differences in terms of the previous experience prior to university of using social networking sites between the two gender groups (Cramer's $V = 0.30$, d.f. = 1, p – n.s.), but when asked whether their frequency of use had increased while at university

women were more likely to agree with this statement than men (Cramer's V = 1.50, d.f. = 1, p < 0.001).

The picture is more complex than this however as we can see significant variations in the use of technologies for social life and leisure and for study purposes.

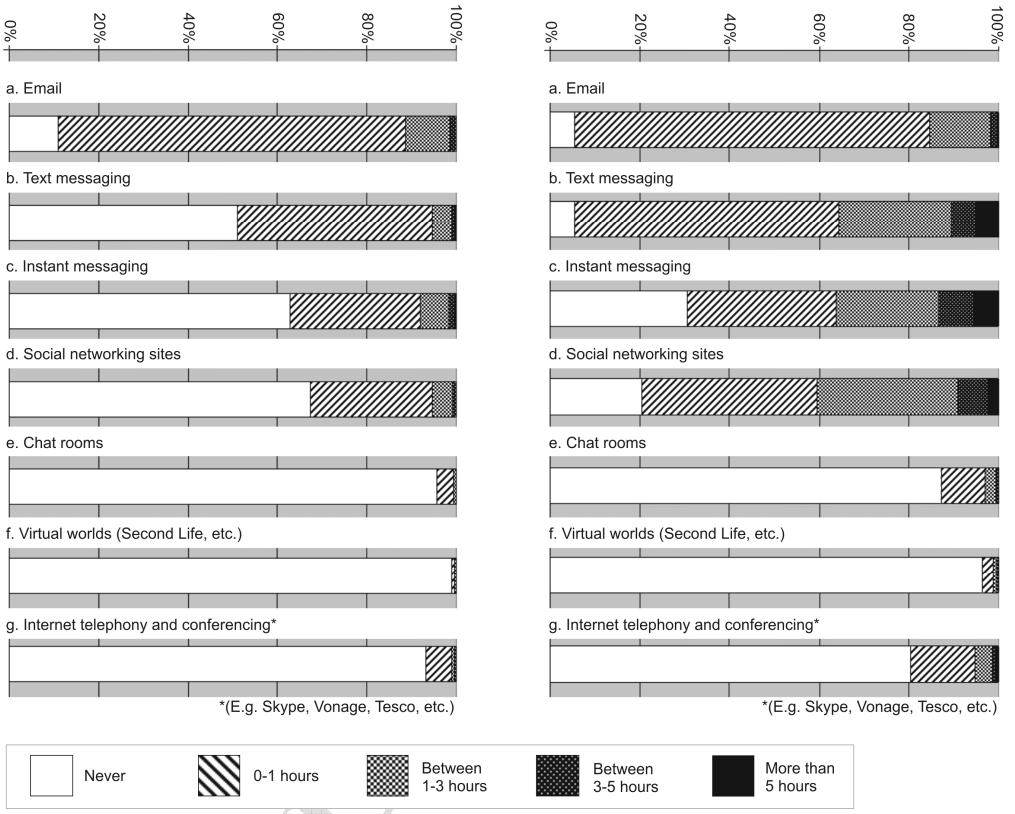

Fig. 2. Study purposes (left) social life and leisure (right).

Patterns in student use of various technologies for social life and leisure were correlated with the use of the same technologies for study at statistically significant levels (p < 0.001). However, the relationships between the use of these technologies for study and for leisure were not equally strong. Cohen (1988) classified the strength of correlations into three groups – weak, moderate and strong. Using his typology the associations between the use of instant messaging (r = 0.54) and Internet telephony (r = 0.52) for study and for social purposes and leisure can be described as strong. The correlations between the use of text messaging (r=0.42) and social networking sites (r=0.41), chat rooms (r=0.36) and virtual worlds (r=0.46) were at a moderate level and it was weak for the use of e-mail (r = 0.29). This suggests that although students were more likely to use some of the newer tools and services that foster interpersonal communication for both study and for social purposes, the relationships between social and educational uses of some of the more established technologies (e.g. email) were not as strong. This relationship, strong in terms of the newer technologies and weakening as they become more established, requires further investigation.

Students were asked specifically about their use of particular technologies that have received significant attention in recent educational technology literature, blogs, wikis and virtual worlds (See for example Williams & Jacobs 2004, Ferris & Wilder 2006). Perhaps surprisingly there is not a significant uptake of any of these technologies amongst the first year students and virtual worlds in particular (although Second Life for example doesn't allow access to their full site under 18). These figures were also consistent across a number of items.

Table 5. The use of new technology forms (Blogs, wikis and virtual worlds) (Jones and Cross 2009)

Yes	No	
21.5%	78.2%	Contributed to a blog
12.1%	87.9%	Contributed to a wiki
2%	98%	Use a virtual world

Two of the questionnaire items asked the respondents to choose firstly the technologies that they used on their courses and secondly those that they were required to use on their course from a list of 13 items (e.g. e-mail, course website, VLE, instant messaging etc., see Figure 3). These question examined claims that students are more advanced users of new technologies and that universities might be forced to respond to their new patterns of use (Thompson 2007). The participants tended to use the same technologies for study purposes that they believed they were required to use on their courses, including some of the newer Web 2.0 communication tools. It is noticeable that in general students tended to use technologies more than they were required to. Furthermore not all the Web 2.0 tools were used for study to a similar degree, for example blogs and Virtual Worlds were used far less often than the tools which fostered other forms of interpersonal interaction or provided access to learning resources. Indeed one of the notable points to make is that some of the key technological tools that are identified with Web 2.0 are only used by minorities of students.

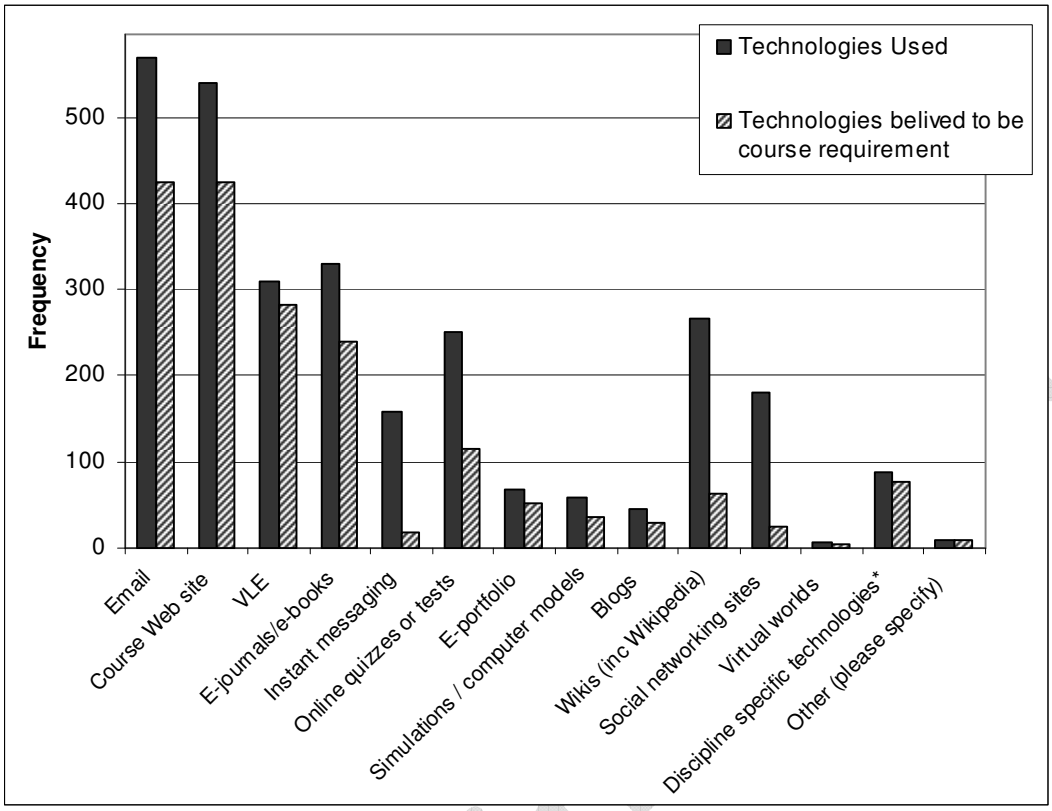

Fig. 3. Technologies used and believed to be required to use (Q4.8: On your current course which of the following technologies have you used? Q4.9: On your current course which of the following are you required to use?).

Nevertheless the differences in percentage of students who chose to use certain technology tools were quite considerable. For example, 26.2 percent of students in the sample chose to use instant messaging in their studies, but 3.2 percent of them were required to use this technology in their studies (Cramer's $V = 0.22$, d.f. = 1, $p < 0.001$). In the case of Wikis 44.7 percent of the respondents used them (including Wikipedia), while only 10.7 percent were required to use this technology (Cramer's $V = 0.,31$ d.f. = 1, $p < .001$). In terms of social networking sites 30.4 percent reported using them and only 4.0 percent were required to do so (Cramer's $V = 0.22$, d.f. = 1, $p < 0.001$). Interestingly, the usages of blogs were at similar levels as 7.7 percent of students used blogs for study purposes and 5.0 were required to use this technology (Cramer's $V = 0.34$, d.f. = 1, $p < 0.001$). Students generally chose to use new technologies in their studies even more than they were required to, but this was most marked with some of the newer social and communicative technologies. Overall further work is required to identify how these technologies are used and the motivations that support their use.

4.2 Confidence and Skills

Students were asked to report on their confidence (defined in relation to skill level) in using various computer technologies and applications on the scale from 1 (Not confident/minimal skill) to 5 (Very confident/excellent skill level) (see Table 6 for item

means). Over 80% of students reported slight confidence and basic skills or better in using presentation software (87.5%), online library resources (86.5%) spreadsheets (84.9%), and in computer maintenance (82.3%). However, over a third reported not confident/minimal skills (not known or not confident) using VLEs (37.7%), writing and commenting on blogs and wikis (40.6%), and graphics software (36.4%); with almost two thirds (60.3%) reporting not confident/minimal skills in video/audio editing software. Students aged 25 years of age and under were more confident of their skills in all of the ICT tasks, but gender and differences between place-based and distance universities were less salient. Male students were more confident than female students in their use of spreadsheets, graphics, audio/video, computer maintenance and security.

Table 6. Self-Reported Skill Levels in Key ICT Tasks (Item Means, 5-point scale)*.

	Type of University			Gender			Age		
	Place based	Distance	F Value	Male	Female	F Value	25 and under	Over 25	F Value
Spreadsheets	3.10	2.40	29.25 [a]	3.27	2.79	19.47 [a]	3.08	2.42	33.72 [a]
Presentation software	3.63	2.09	190.95 [a]	3.41	3.29	1.15	3.62	2.36	135.07 [a]
Graphics	2.30	1.68	28.25 [a]	2.48	2.04	18.21 [a]	2.29	1.72	29.55 [a]
Video/Audio	1.79	1.35	17.72 [a]	2.01	1.59	19.38 [a]	1.81	1.39	17.70 [a]
Online library resources	3.36	1.97	165.00 [a]	2.99	3.14	1.92	3.32	2.38	74.76 [a]
Computer maintenance	3.25	2.28	55.33 [a]	3.56	2.86	34.35 [a]	3.28	2.32	62.50 [a]
Computer security	2.85	2.15	28.73 [a]	3,27	2.50	44.04 [a]	2.86	2.25	24.14 [a]
Writing and commenting on blogs and Wikis	2.50	1.53	52.63 [a]	2.54	2.22	6.93 [b]	2.53	1.57	60.85 [a]
VLE (Blackboard, Moodle etc.)	2.98	1.19	309.30 [a]	2.71	2.61	0.57	2.92	1.75	75.68 [a]

*One-way ANOVA results:
[a] $p < .001$
[b] $p < .01$

Students aged 25 years of age and under and students at place based universities were more confident of their skills in all of the ICT tasks, but gender differences were less salient. Male students were more confident than female students in their use of spreadsheets, graphics, audio/video, computer maintenance and security.

Notably, there were statistically significant correlations in terms of the degree of the respondents confidence in performing all of the technology tasks listed in Table 6, i.e. the participants who were confident of their skill level in one technology task were also confident of their skills in the others, although the degree of confidence expressed in relation to each technology depended on the task in question.

It is an interesting finding that students expressed relatively low levels of confidence in their skill levels in relation to the VLE. It is also noticeable that the difference in levels of confidence is significantly different between students at place based and distance

universities, although two factors may affect these findings. Firstly 94.9 percent of the students at University C, the distance university, were studying part-time, while at other universities it was from 0 to 3.1 percent and secondly 87.4 percent of University C students were older than 25 compared to, for example, only 4.0 percent of students in University A. Both mode of study (whole time/part-time) and student age seem to have an impact on confidence levels but further investigation is needed to clarify which of these influences is most important.

5. Discussion and Conclusions

This research confirms many of the general points found in studies outside of the United Kingdom in relation to the level of technology access and use. The laptop and the mobile phone are not yet universal but the vast majority of students make extensive use of mobile technologies and computing facilities for communication and for access to course materials and resources. In this way this study helps to confirm the research that has shown that the conditions in terms of the availability and use of technologies required for a Net generation and the development of Digital Natives exists within the population entering university. However we would counsel caution to all those tempted to see a confirmation of the Net generation thesis. Firstly there exist a number of minorities within the student population and secondly there is a wide variation within as well as between age groups. The use of the term Millenial has been more sophisticated in its approach to students' age than either the Net generation or Digital Natives theses. Authors using the term Millenials have recognized the complexity of the context facing students entering university, with mature students facing family commitments combining with young students, a university environment encouraging the use of digital technologies and an increasing ethnic and cultural diversity in the student body (Oblinger & Oblinger 2005 and Howe & Strauss 2000). The Millenial approach also recognizes that age is not the sole determinant : "Although these trends are described in generational terms, age may be less important than exposure to technology." (Oblinger & Oblinger 2005, 2.9). This difference in understanding breaks down the simple generational binary opposition and allows older students to develop different approaches based on their exposure to new technologies. We would endorse this more complex picture but add to it in a number of ways.

The findings of our survey show that students are active users of technology and that in general they use technologies more than they believe that they are required to. Students seem to respond to the requirements of their courses, programmes and universities as suggested by Brown & Czerniewicz (2008). However we should also note that students in our sample differed in their reports about which technologies they believed they were required to use on all the courses we surveyed. Some courses showed a wider discrepancy than others but in general we should not assume that students fully understand course requirements in terms of technology use, no matter how clearly these requirements are expressed and no matter how often they are reinforced. However despite variations in understanding of course requirements it is likely that students are responding to aspects of the local course, programme and university context.

Our survey also shows the persistence of minorities. In our sample we found a small minority of students who report make very little use of email (Jones and Cross 2009). The numbers who didn't use email for both study and for social life and leisure were small (n=3) but a larger group (n=42) didn't use email for either study or their social life and then only in a very limited way for the alternative use. This low use of email does not necessarily imply a resistance to technology because email may have been replaced by other means of communication but it does imply that universities cannot expect email to be a universal system for communication with students. We also identified a large minority who make use of the Internet to download or upload materials and a smaller minority who contribute to blogs and wikis or engage with virtual worlds. Far from our research revealing a single generation of students we find a complex picture of minorities, most of whom engage in a wide range of technology uses with a high frequency but who do not show a strong impulse towards the kind of participation and generational homogeneity predicted by Net generation or Digital Native inspired literature.

Further work is required to clarify some of the areas identified in the results from this survey. This survey was a single snapshot taken at the end of the students first year of study. In the second phase of the research we have issued two linked survey instruments, one at the start of the first year in the autumn of 2008 and a second at the end of the first year in the spring of 2009 to look for changes taking place during the first year of study. We also know little about the motivations that lie behind the patterns of technology use revealed by the survey. In the first phase of research we conducted a small number of interviews with students (n=10) and we have increased the number and spread of the student interviews in the second phase (n=58) and accompanied this with cultural probes based on the Day Experience Method (n=18) (Riddle and Arnold 2007). Taken together the interviews and cultural probes will provide a more detailed and richer picture of the activities of first year students linked to the survey sample. Through these methods we hope to shed more light on why students use particular technologies and what their motivations are.

If we had to sum up the outcome of our work in a single message it would be to advocate caution to all those arguing that universities and academic staff have to change to accommodate a new Net generation of Digital Native students. The new generation of students show significant age related differences but the generation is not homogenous nor is it articulating a single clear set of demands. It seems to us that universities and academics are, as always, faced with choices about how to change and these choices need to be better informed about the kinds of students that are entering their institutions.

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